

WHAT IS CLAIMED IS:

1. A method of detecting a fundamental beat frequency in a predetermined time interval of a music signal, comprising:
 - a) processing a music signal with the discrete wavelet transform to obtain a set of coefficients;
 - b) processing a subset of the coefficients to obtain a plurality of candidate beat frequencies contained in the corresponding portion of the music signal;
 - c) determining the harmonic relationships between the candidate beat frequencies; and
 - d) determining the fundamental beat frequency based upon the determined harmonic relationships.
2. The method of claim 1, wherein determining the fundamental beat frequency comprises selecting one of the candidate beat frequencies having a non-ambiguous harmonic structure.
3. The method of claim 1, wherein determining harmonic relationships comprises determining integer relationships between the candidate beat frequencies.
4. The method of claim 1, wherein:

the candidate beat frequencies each comprise a range of frequencies;

processing a subset of the coefficients comprises calculating
autocorrelation values; and

determining the fundamental beat frequency comprises:

identifying the candidate beat frequency having a non-ambiguous
harmonic structure and the strongest relative
amplitude value calculated to model human auditory
perception;

determining the harmonic relationship between the candidate beat
frequency having a non-ambiguous harmonic
structure and the strongest relative amplitude value
calculated to model human auditory perception, and
the lowest candidate frequency having a non-
ambiguous harmonic structure; and

selecting the fundamental beat frequency as the frequency range of
the lowest candidate beat frequency having a non-
ambiguous harmonic structure multiplied by the
harmonic relationship.

5. The method of claim 1, wherein

processing a subset of the coefficients to obtain a plurality of candidate
beat frequencies comprises calculating autocorrelation
values of a subset of the coefficients and

determining the fundamental beat frequency comprises determining the fundamental beat frequency based upon the determined harmonic relationships and the relative amplitude values calculated to model human auditory perception.

6. The method of claim 1, wherein processing a subset of the coefficients to obtain a plurality of beat frequencies comprises creating a buffer of a predetermined number of coefficients.
7. The method of claim 6, wherein processing a subset of the coefficients comprises creating a dynamic and weighted histogram of beat frequencies.
8. The method of claim 7, wherein creating a dynamic and weighted histogram comprises consolidating values in adjacent bins of the histogram.
9. The method of claim 8, wherein consolidating values in adjacent bins of the histogram comprises using a mathematical window function.
10. A method of detecting the localized fundamental beat frequency of a digital music signal comprising:
 - a) detecting time period peaks above a threshold in a predetermined sized buffer of an autocorrelation function of a decomposition of the music signal using the DWT;
 - b) determining which of the detected peaks occur most often based on human auditory perception;

- c) determining harmonic relationships between frequencies corresponding to the detected peaks; and
- d) selecting the frequency that has the highest amplitude value calculated to model human auditory perception consistent with a non-ambiguous harmonic structure.

11. Apparatus for analyzing the beat of a music signal, comprising:

a fundamental beat frequency identifier generating a fundamental beat frequency signal from the music signal;

a time domain envelope analyzer comprising a peak generator generating a peak signal from the music signal, the peak signal comprising amplitude and time values of amplitude peaks of the music signal; and

a comparator and beat identifier, coupled to the fundamental beat frequency identifier and the time domain envelope analyzer, and generating, from the peak signal and fundamental beat frequency signal, a series of time values identifying the amplitude peaks corresponding to onset times of beats within periods based on the fundamental beat frequency signal.

12. Apparatus for generating a multimedia signal, comprising:

a gauge comprising:

a first input terminal receiving an image signal comprising
digital data representing a plurality of still images;

a second terminal receiving a digital audio signal;

a third input terminal receiving a minimum display period;

a first output terminal supplying the number of still images for
display; and

a second out terminal supplying a music signal generated
from the digital audio signal and having a duration at
least as long as the number of still images multiplied
by the minimum display period;

a beat analyzer receiving the music signal and generating a series of
onset times and amplitude values of amplitude peaks occurring at
the onset of predominant beats;

a beat strength sorter coupled to the beat analyzer and generating a first
array of beat elements corresponding to the amplitude peaks, each
element comprising a beat onset time and a beat amplitude value,
the first array sorted according to the beat amplitude values;

a selector coupled to the gauge and the beat strength sorter, the selector
generating a second array of beat elements sequentially selected

from the first array and having a number of beat elements that is at least equal to one less than the number of still images; and

a synchronizer coupled to the gauge and the selector, the synchronizer generating a digital multimedia signal comprising an audio component corresponding to the music signal and a video component corresponding to a sequential output of the still images, the sequential advance times of the still images corresponding to the beat onset times of the second array beat elements.

13. Apparatus for generating a multimedia signal, comprising:

a music and video processor receiving a digital moving video data signal and a digital music data signal, the music and video processor generating:

a video clip signal comprising the digital moving video data signal separated into video clips; and

an array of selected beat elements corresponding to amplitude peaks of the digital music data signal, each element comprising a beat onset time relative to the digital music data signal and a beat amplitude value;

a video clip play order selector coupled to the music and video processor, the video clip play order selector comprising:

an audio array generator receiving the array of selected beat elements and generating a sequential set of audio durations, the sum of the audio durations being equal to the duration of the digital music data signal; and

a video editor receiving the video clip signal and generating a video output signal comprising a sequential series of video elements corresponding on a one-to-one basis to the sequential set of audio durations, each of the video elements comprising at least a portion of at least one of the video clips; and

an audiovisual sequencer coupled to the video clip play order selector and generating a multimedia digital output signal having a video component formed from the video output signal and an audio component formed from the digital music data signal.